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AUTHOR Ganey, Rodney F.
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ABSTRACT

The goal of this paper was to develop a theory of organization/environment interaction by examining the impact of perceived environmental uncertainty on organizational processes and on organizational goal attainment. It examines theories from the organizational environment literature and derives corollaries that are empirically tested using a data set of 99 county extension offices in Iowa. The theory is developed using axiomatic theory-building techniques and inductive path analysis. First, the major theories are identified and defined through a review of the literature. Second, a set of theoretical statements is identified and analyzed for theoretical and operational linkages. Third, path analysis is used to evaluate the principles and make revisions in the theory. Finally, the revised theory is discussed and critiqued on the basis of the research presented, scope, and parsimony. The paper concludes that the theory may be appropriate only for organizations that are coping well with conditions of uncertainty, which does not apply to the county extension offices. (Author/LD)

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DEVELOPMENT OF AN AXIOMATIC THEORY OF ORGANIZATION/ENVIRONMENT INTERACTION: A THEORETICAL AND EMPIRICAL ANALYSIS

By

Rodney F. Ganey

Department of Sociology and Anthropology
Iowa State University
Ames, Iowa

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The Rural Sociological Society, Burlington, Vermont
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"Development of an Axiomatic Theory of Organization/Environment Interaction: A Theoretical and Empirical Analysis"

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Abstract

What is the impact of perceived environmental uncertainty on organizational processes and on organizational goal attainment? This paper is designed to answer this question by drawing out a set of major theoretical propositions from the organizational environment literature and deriving corrolaries which are empirically tested using a data set of 99 county extension offices in Iowa. The ultimate goal of this paper is to develop a theory of organization/environment (O/E) interaction. The theory will be developed utilizing axiomatic theory building techniques (Hage, 1972; Zetterberg, 1975), and inductive path analytic techniques. The theory building process will involve four steps. First, the major theoretical concepts will be identified and defined through a review of the literature. Second, a set of theoretical statements will be identified and analyzed for theoretical and operational linkages. Third, path analysis using Joreskog's maximum likelihood method will be used to evaluate the principles of the theory and make revisions in the theory. Finally, the revised theory will be discussed and critiqued on the basis of the research presented, scope, and parsimony.

INTRODUCTION

The goal of this paper is to develop a theory of organization/environment (O/E) interaction. The theory will be developed utilizing axiomatic theory building techniques (Hage, 1972; Zetterberg, 1975), and inductive path analytic techniques. The theory building process will involve four steps. First, the major theoretical concepts will be identified and defined through a review of the literature. Second, a set of theoretical statements will be identified and analyzed for theoretical and operational linkages. Third, path analysis will be used to evaluate the principles of the theory and make revisions in the theory. Finally, the revised theory will be discussed and critiqued on the basis of research presented, scope, and parsimony.

THE MAJOR THEORETICAL CONCEPTS

Hage (1972:9) identifies two major kinds of theoretical concepts. Those which label categories or classes of phenomena and those which label dimensions of phenomena, either variable or nonvariable. In this section, the literature on O/E interaction will be reviewed with the goal of identifying the general variable dimensions of O/E interaction. These variable concepts will serve as the building blocks for an axiomatic theory of O/E interaction.

Does any organization exist totally independent of external "environmental" influences? The answer to this question may seem obvious, but it is interesting to note how many of the major organizational models have ignored O/E interaction. Hass and Drabek (1973) present an analysis of the eight major complex organization models including the Weberian, human relations and the scientific management models. They find that only the open system model offers an adequate analysis of O/E interaction. Despite this oversight in the conceptual development of organization theory, recent

literature reveals a surge of interest in O/E interaction (e.g., Emery and Trist, 1965; Lawrence and Lorsch, 1967a, 1967b; Nebeker, 1975; Nystrom, 1974; Osborn and Hunt, 1974; Pennings, 1975; Terreberry, 1968; Tosi et. al., 1973).

One of the first studies to analyze O/E interaction was conducted by William Dill (1958). He related environmental factors to organizational structure and participant behavior. The study involved an analysis of two Norweigan firms and found that "the autonomy of managerial personnel—their decisions for and against independent action--may be influenced by the structure of the environment, by the accessibility of information about the environment, and by managerial perceptions of the meaning of environmental information" (Dill, 1958:23).

Thompson and McEwen (1958) in another early study point out the interdependence of complex organizations within the larger society. They treat other organizations as the focal organization's environment and propose that:

> ...because the setting of goals is essentially a problem of defining desired relationships between an organization and its environment change in either requires review and perhaps alteration of goals...reappraisal of goals is a more constant problem in an unstable environment than in a stable one (Thompson and McEwen, 1958:256).

These studies suggest three aspects of O/E interaction, the structure of the environment, the flow of information from the environment to the organization, and the degree of certainty that can be attributed to the information. These aspects of O/E interaction provide a useful framework for identifying general variable concepts.

Structure of the Environment

The structure of the environment has been analyzed from a number of different perspectives. The first perspective has to do with how individuals in an organization might perceive the environment (Aldrich, 1975; Duncan, 1973; Emery and Trist, 1965; Terreberry, 1968). Aldrich offers seven dimensions of the environment which summarizes this literature.

1. Its stability or instability in terms of the degree of turnover of elements in the environment.

2. Its homogeneity or hetergeneity in terms of the degree of similiarity among the population to be dealt with, both individual and organizational.

3. Its concentration or dispersion in terms of the degree to which the population dealt with is distributed across the range of the domain of the organization.

4. Its environmental capacity in terms of the level of resources available to the organization.

5. Its domain consensus in terms of the degree to which the organization's claim to its domain is disputed or recognized by other organizations.

6. Its turbulence or placidness in terms of the extent to which the environment is disturbed or changed by other external activities.

7. Its mutability or immutability in terms of the extent to which the environment is open to change or manipulation by the organization (Hall, 1977:312).

All seven of these dimensions might provide useful general concepts, but not all of these dimensions have been examined empirically. Another perspective on the structure of the environment divides it into the general environment and the specific environment (Hall, 1977). According to Hall's breakdown the general environment is composed of:

1. Technological Conditions
2. Legal Conditions

3. Political Conditions
4. Economic Conditions
5. Demographic Conditions
6. Ecological Conditions
7. Cultural Conditions

These are broad specturm conditions and although they should be considered in O/E interaction they do not provide us with general concepts useful to this analysis, but rather provide a general background in which an organization exists. These factors will place limits on the types of organizations which will come into existence as well as on the distribution and number of organizations which exist in any particular social cultural system (Azumi, 1972).

Hall's specific environment relates to the area of interorganizational relations. It is composed of the organizations and individuals with which an organization is in direct interaction. This literature has either focused on analyzing the characteristics of organizations which compose an organizational set (Aiken and Hage, 1968; Paulson, 1974), or upon interorganizational exchange in the form of coordination or conflict (Assael, 1969; Klonglan et. al., 1973; Litwak and Hylton, 1962; Mulford and Mulford, 1977). The general concept of interorganizational coordination and conflict can be added to the previously identified general concepts of environmental structure.

Flow of Information

The flow of information into an organization has been particularly emphasized by the open systems theorists (Azumi and Hage, 1972:521; Bertalanffy, 1968; Buckley, 1967; Hall and Fazen, 1968; Nystrom, 1974). Feedback is the concept used to describe the flow of information into an or-

ganization. It can vary by amount or by quality, and in an increasingly turbulent environment it plays a crucial role in organizational survival. Feedback provides an organization with an institutionalized flow of information concerning the status of the environment. It therefore acts as a channeling device through which the organization sees the environment.

Degree of Uncertainty

The final aspect of O/E interaction relates to the degree of uncertainty an organization has about its environment. This is often termed environmental uncertainty and may be brought about by the structure of the environment or due to a lack of adequate information concerning the environment (Terreberry, 1968; Lawrence and Lorsch, 1967a). Nystrom (1974) also points out that increased feedback may increase subjective uncertainty. Various researchers have used the concept environmental uncertainty and generally they define it in the same way. Pekar (1976:15) defines it as "the predictability or likelihood that a particular event or occurance will meet plan objectives." Nystrom (1974) defines it as a situation where probabilities cannot be estimated. Related to this definition is one proposed by Nebeker (1975:282):

> Perceived environmental uncertainty refers to the difficulty an individual has in deciding what is the most appropriate action--which choice will bring about the overall best results. Faced with a decision between two or more alternatives, the individual who perceives the environment as uncertain will have a difficult time choosing between them.

Environmental uncertainty may be more a characteristic of individuals in an organization than a characteristic of the environment (Downey, 1975; Downey, Hellriegel and Slocum, 1977), but it appears to be highly dependent

on the state of the environment and the interpretation of that state by members of an organization.

This concludes the analysis of general O/E interaction concepts. The concepts which have been identified fit Hage's definition of the most useful type of concepts to begin with in developing an axiomatic theory. In the next section a set of theoretical statements will be developed which will serve as postulates for deriving correlaries.

GENERAL THEORETICAL PROPOSITIONS

Hage notes that the most useful theoretical statement is the continuous theoretical statement. These are composed of variable concepts and specified linkages which take the form of "the greater the A, the greater the B." Propositions of this type can be derived from the wealth of current research on O/E interaction. Some of these findings are presented below. They are organized according to the interaction of environment structure, environmental uncertainty and the structure and process of organizations.

Environment--Uncertainty

There have been a number of studies which examined the relationship between the environment and uncertainty. These studies have involved both theoretical and empirical research. In one of the major theoretical analyses of (O/E) interaction, Terreberry (1968) proposed that a high degree of environmental turbulence produces a high degree of environmental uncertainty in organizations. Duncan (1973) found that organizations in both dynamic and complex environments have the greatest amount of perceived environmental unvertainty. Lawrence and Lorsch (1967) found that organizations varied

based on the rate of change in their environment, time span of definitive feedback, and degree of environmental uncertainty. These studies seem to indicate a rather clear relationship between the environment and uncertainty, but other studies have found conflicting results.

In a more recent empirical analysis which attempted to test some of the earlier findings, Pennings (1975) found that environmental uncertainty was positively and significantly related to environmental instability and competitiveness, but he also found that it was not significantly related to seven other environmental dimensions including complexity (both subjective and objective), feedback, and resource availability. Tosi et. al. (1973) also found conflicting results when they subjected the measures of Lawrence and Lorsch to analysis using objective measures of environmental dimensions. Downey and Slocum (1977) found that cognitive process variables rather than perceived environmental dimensions were more strongly related to perceived uncertainty. The literature on Environment--Uncertainty appears to be ambiguous, but it is certain that environmental uncertainty is related to some dimensions of the environment. Further research is needed to identify those crucial dimensions and show their interrelationship to the subjective characteristics of organizational members.

Uncertainty--Organization Structure and Process

Some studies have looked at the direct relationship between perceived environmental uncertainty and organization structure and process. Schmidt and Cummings (1976) found a significant relationship between perceived environmental uncertainty and organizational differentiation. Keller, Slocum and Susman (1974) found that organizations operating under conditions of

high uncertainty would exhibit less formal hierarchy, a higher degree of emphasis on group decision making and a lower degree of emphasis on organizational rules. The degree of differentiation and integration in organizations were found to be contingent on the level of environmental uncertainty in a study by Lawrence and Lorsch (1967). Pennings (1975) looked at the effect environmental uncertainty had on a variety of organization structure variables. He found that environmental uncertainty had no significant impact on nine structural variables. These variables included communication, participativeness and power but they did not include some of the previously mentioned variables such as centralization, differentiation, and formalization. Here again the findings are somewhat ambiguous and further analysis would be in order.

Environment--Organization Structure and Process

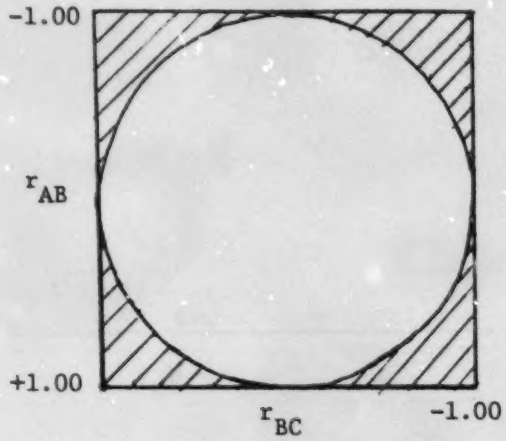
Other studies have shown the direct relationship between the environment and the structure and processes of an organization. As noted earlier, Thompson and McEwen (1958) found that the greater the instability of the environment the greater the number of alterations in organizational goals. Organizational goal alterations relates to Hage's concept of organization adaptability. Osborn and Hunt (1974) found that as the environment becomes more complex, the organization must adjust internal structures and processes to maintain or increase effectiveness. Other reserachers have found environmental complexity to be positively related to organizational flexibility, decentralization, participation in decision making and lower formalization (Bennis, 1966; Burns and Stalker, 1961; Lawrence and Lorsch, 1967). Becker and Gordon (1965) found a similar relationship between environmental complexity and decentralization. They also found that the rapidity of response

and the heterogeneity of the environment leads to decentralization.

The review of the literature presented above leads us to the development of several general propositions, but before identifying these propositions it is important to consider the nature of the relationships presented above. Generally the relationships could be described as continuous, in Hage's sense, but for the most part they do not imply a causal relationship. Notable exceptions are Becker and Gordon (1965) and Paulson (1973). Although the relationships are not stated in a causal sense the discussions contained in the articles often tended toward this interpretation. Costner and Leik (1964) have shown the utility of causal thinking in making deductions in axiomatic theory. They indicate that the sign rule, which is normally employed in deriving propositions, does not produce reliable deductions unless the correlations between the concepts are very high or other strict conditions are met. The sign rule is based on the premise that the general propositions have symmetrical linkages. Zetterberg (1965) classifies these linkages as reversible. Using the sign rule if $A \overset{+}{\longleftrightarrow} B$, and $B \overset{+}{\longleftrightarrow} C$, then $A \overset{+}{\longleftrightarrow} C$, you just add the signs up to derive the sign of $A \longrightarrow C$. Costner and Leik (1964) prove, by using partial correlation analysis, that a set of sufficient conditions (that is, regardless of the magnitude of the correlations) for the validity of the sign rule is, if:

1. postulates are stated in asymetric causal form;
2. the common variable in the two postulates is prior to one but not to both of the other two variables; and
3. a "closed system" is assumed, i.e., it is assumed that there is no connection between the variables in the postulates except those connections stated or implied in the postulates.

If the above theoretical linkage is not specified, the relationships between A←→B, and B←→C have to be very high as depicted in the diagram below.



The magnitude of the correlations would have to be in the shaded areas; otherwise the relationship between A←→C would not hold. Without going into a further explanation of Costner and Leik's analysis suffice it to say that it would prove very useful if the linkages met the criterion stated above. In Hage's (1965) axiomatic theory of organizations the propositions were not stated in a causal form. His emphasis was upon developing all possible propositions, and he was not concerned with the validity of the propositions. He left this up to empirical analysis.

Nonetheless, Hage does not reject the notion of causality and he even encourages searching the literature for intervening causal variables (Hage, 1972:93). It appears from the research presented above that environmental uncertainty does play the role of an intervening causal variable in the relationship between the environment and the structure and processes of an organization. This is a relationship which seems to be intuitively acceptable, but it could be subject to empirical verification utilizing partial correla-

tions analysis as suggested by Costner and Leik (1964) or more appropriately using partial regression analysis as suggested by Blalock (1968).

THEORETICAL STATEMENTS

A midlevel axiomatic theory of (O/E) interaction can now be developed based on the review of the literature presented above.

Table I presents the major propositions and derived corollaries of the theory of O/E interaction. Note that the linkages are stated in causal form which implies that this author is taking some liberties of interpretation with the previously stated relationships.

TABLE I: MAJOR PROPOSITIONS AND COROLLARIES OF THE THEORY

Major Propositions

1. Increasing environmental turbulence causes increased environmental uncertainty. (Terreberry)
2. Increasing environmental instability causes increased environmental uncertainty. (Duncan)
3. Increasing environmental complexity causes increased environmental uncertainty. (Duncan)
4. Decreasing quality of feedback causes increased environmental uncertainty. (Lawrence and Lorsch)
5. Increased environmental uncertainty causes increase differentiation. (Schmidt and Cummings)
6. Increased environmental uncertainty causes increased flexibility. (Thompson and McEwen)
7. Increased environmental uncertainty causes decreased centralization. (Lawrence and Lorsch)

Derived Corollaries

1. Increasing environmental turbulence causes increased differentiation.
2. Increasing environmental turbulence causes increased flexibility.
3. Increasing environmental turbulence causes decreased centralization.
4. Increasing environmental instability causes increased differentiation.

5. Increasing environmental instability causes increased flexibility.
6. Increasing environmental instability causes decreased centralization.
7. Increasing environmental complexity causes increased differentiation.
*8. Increasing environmental complexity causes decreased adaptiveness.
*9. Increasing environmental complexity causes decreased centralization.
10. Decreasing quality of feedback causes increased differentiation.
11. Decreasing quality of feedback causes increased flexibility.
12. Decreasing quality of feedback causes decreased centralization.

*indicates proposition which has been tested in literature and was mentioned earlier.

Some derived corollaries have already been tested in the literature and have been supported. The O/E axiomatic theory has 10 unique theoretical statements. These merit closer examination.

Recall that all of these are based on the assumption that environmental uncertainty acts as a causal intervening variable. The theoretical linkage between these concepts can be specified by three general premises. First, the environment of an organization will impact an organization if the organization is an open system, which most if not all organizations are. Second, the organization perceives the environment, and interprets the environment in relation to the organization's goals, by the degree of unpredictability it encounters when making decisions related to the organization's goals, be they either formal or informal. In turn the third premise is that the organization alters its structure and processes in order to deal with its perceived environmental uncertainty. These structural changes should be consistent with the theoretical statements.

The operational linkages may be assumed to be linear although certain limits may be operating. The literature offers very little beyond the directions of the proposed relationships. This has been incorporated into the propositions, but further elaboration on the linkages will have to depend on a closer examination of empirical relationships. The next section will be devoted to developing a theoretical model of (O/E) interaction based on the propositions and linkages stated above.

EMPIRICAL ANALYSIS

The purpose of this section is to analyze (O/E) interaction utilizing an existing data set. Although the data set does not conform exactly to the concepts and theoretical statements presented above, it will provide useful insights into the validity of the causal theory developed above.

The Data

The data for this analysis comes from a 1978 study of 99 county extension offices in the state of Iowa. Questionnaires were completed by the County Extension Directors (CED's) in each county. The variables are therefore subjective in nature and represent the perceptions of these key informants. The questions were asked in such a way that the responses should reflect a more generalized "organizational" opinion rather than idiosyncratic responses. Even so, there remains the question of whether an individual response can be used as an organization response and whether perceived environmental uncertainty, the key variable in the study, can be considered as an organizational variable as opposed to an individual characteristic.

The Variables

Twelve composite scales were developed from the data to represent possible components of (O/E) interaction. The composites and the reliabilities (alpha values) are presented below. Note that the dimensions are divided into environment components, environmental uncertainty, structure and processes of the organization and organizational goal attainment. Additionally, the number of indicators for each composite are given in parentheses. All the variables were measured using an 11 point Likert-type scale.

TABLE II: SCALES AND RELIABILITIES

	alpha
Environment	
Competition (2)	.68
Environmental Capacity (2)	.70
Instability (1)	1.00 (assumed)
Vertical Feedback (2)	.77
Horizontal Feedback (3)	.81
Environmental Uncertainty (3)	.62
Organizational Structure and Processes	
Socialization (2)	.65
Communication (2)	.81
Flexibility (1)	1.00 (assumed)
Tension (2)	.71
Commitment (3)	.83
Goal Attainment (3)	.85

The environmental variables represent some of the major dimensions of environmental structure and feedback which have been previously identified. Competition measures the degree to which the County Extension Director (CED) believes his office is losing clientele and volunteer leaders to other organizations. Environmental Capacity refers to the extent to which

the CED believes his office has a sufficient amount of resources in terms of finances and equipment to fulfill its mission. Instability refers to the extent to which the CED perceivies rapid changes in the social, economic or political conditions of his county. Vertical Feedback refers to the degree to which the Area Extension Director provides feedback that is constructive and leads to improvements at the county level. Horizontal Feedback refers to the degree to which the County Extension Council provides feedback that is constructive and leads to improvements for the County Extension Office.

It is expected that these variables will determine the level of perceived environmental uncertainty in the county extension organization. Perceived environmental uncertainty was measured by the CED's response to the following questions:

1. How often do you believe that the information you receive from area and state Extension staff is sufficient for decision-making?

2. How often do you believe that the information you have about your county is sufficient for decision-making?

3. How often do you know what to expect in your dealings with other people or organizations in the county?

These items were reverse coded such that a high score was indicative of high uncertainty.

The five organizational structure and process variables were largely taken from Etzioni's compliance theory (Etzioni, 1975). The 99 county Extension offices in Iowa tend to have very similar structural characteristics. Therefore, variables such as centralization, differentiation and formalization have a very low degree of variance across county offices. This provides a definite drawback for explicitly testing the axiomatic

theory. Socialization was measured by the CED's perception of the adequacy of job orientation and training. Communication was measured by the degree to which the extension staff interacted in their daily activities and exchanged information about what was going on in their program areas. Flexibility was measured by the extent to which the staff could adjust to changes in work routines. Tension was measured by the degree to which the staff feels pressured to work with clientele groups they would prefer not to work with or in program areas they would prefer not to work in. Commitment was measured as the extent to which the staff were willing to work overtime, felt a strong desire to meet the objectives of the County Extension Service, and exerted high levels of effort beyond minimal job expectations. Goal Attainment was measured by the degree to which the quantity, quality and distribution of programs to various clientele groups were consistent with the goals.

Socialization and communication are proposed to be temporally prior to the other three variables (Mulford et. al., 1972). Commitment and tension have been identified by Etzioni as key process variables which are determined by socialization and communication (Mulford et. al., 1972). Although the Mulford study does not use the concept of commitment, it seems to be highly related to scope which is used. Commitment is defined as the intensity of positive involvement by an actor to an organization (Etzioni, 1975:9). The variable flexibility is not identified by Etzioni, but it was identified in General Proposition Number 6. Flexibility represents the organization's ability to react to emergency situations and changes in routine. There is no evidence as to temporal placement of this component of an organization within the framework developed, so it will be assumed

to enter at the same time as commitment and pervasiveness. The final variable, goal attainment, is a general measure of organizational effectiveness. Goal attainment is assumed to be caused by all of the preceding variables in interaction with one another.

Methodology

The first step in the empirical analysis is to derive a correlation matrix. This matrix will display the relationships between all the variables. The relationships between the environment and the organizational structure and process are crucial to testing the derived corollaries. Note that since reliability estimates are available for almost all the variables, it is possible to correct for attenuation caused by random measurement error (Bohrnstedt and Carter, 1971). Next, partial correlation analysis will be conducted. According to the axiomatic theory developed in the first section of this paper, it is exptected that perceived environmental uncertainty acts as an intervening causal variable in the relationship between the environment and the organization structure and processes. By partialiing out the effect of uncertainty, it is expected that the relationship between the environmental variables and the organizational variables will be moderated to insignificance. Finally, path analysis using Joreskog's method of analysis of covariance structures will be used to derive maximum likelihood estimates (Joreskog and Sorbom, 1978). This method of path analysis is utilized due to the abstract level of the axiomatic theory and the availability of multiple indicators of the latent variables in the theory. A structural equation model which is consistent with the axiomatic theory is derived and tested and finally an alternative model is presented and evaluated.

Findings

Table 1 contains the corrected for attenuation correlation matrix. Note that the only environmental variables significantly related to perceived environmental uncertainty are competition (r = .50) and environmental capacity (r =-.28). The competition-uncertainty relationship tends to confirm Major Proposition 1 in so far as competition is a form of turbulence. Aldrich's dimension of environmental capacity might be expected to be negatively related to uncertainty as is found in this data. Uncertainty should be lowest where sufficient financial and equipment resources are available. Instability is clearly not related to uncertainty in this study (r = .02). Therefore, there is evidence to reject Major Proposition 3. Both types of feedback are also not significantly related to uncertainty (r = -.11 for vertical and r = -.04 for horizontal). Therefore, there is evidence to reject Major Proposition 4. It is interesting to note that these relationships are in the direction predicted, although they are not significant.

Perceived environmental uncertainty is significantly related to all of the organizational process and structure variables except commitment. Socialization is very strongly related to uncertainty (r = -.74). This would indicate that as uncertainty increases the usefulness or adequacy of job orientation and training declines. Obviously, it is difficult to train people for job situations under conditions of uncertainty. Communication is also significantly related to uncertainty in a negative direction (r = -.28). This would indicate that communication in these organizations is adversely affected by conditions of uncertainty. It appears that the staff tends to reduce interaction when they do not feel they have sufficient environmental information to pass along meaningful suggestions. Perceived

environmental uncertainty is also significantly negatively related to organizational flexibility (r = -.31). This finding provides evidence to reject Major Proposition 6. These organizations do not exhibit increased flexibility under conditions of uncertainty, but rather uncertainty reduces their ability to adapt to changes in work routines. Given the three relationships presented above it is not surprising to find that uncertainty is significantly positively related to organizational tension (r = .34). Perceived environmental uncertainty is not significantly related to organizational commitment although the relationship is negative (r = -.13). Finally, perceived environmental uncertainty is significantly related to goal attainment in a negative direction (r = -.39). This relationship is consistent with the preceding relationships and is indicative of the negative impact perceived environmental uncertainty can have on the organization.

It would appear from this preliminary analysis that the county Extension offices are not coping well with perceived environmental uncertainty, while the Major Propositions relating uncertainty to organizational structure and process tend to have the underlying assumption that the organization is adjusting well to conditions of uncertainty. This finding poses a dilemma for evaluating the axiomatic theory using this data set, but additional insights may be gained by further analysis.

The Derived Corollaries are based on the impact of the environmental variable on the organization structure and process given the intervening effect of perceived environmental uncertainty. Competition is significantly related to all the structure process variables except socialization. Competition follows the same direction of effects in these significant rela-

tionships as did perceived environmental uncertainty. The relationship with flexibility (r = -.36) provides evidence to reject Derived Corollary 2. The environmental dimension of competition appears to have the strongest effect on the structure and process of these organizations. This could be due to the recent rise in the pervasiveness of continuing education offered by universities, community colleges and high schools. Environmental Capacity is significantly positively related to socialization (r = .33) and goal attainment (r = .24), and is significantly negatively related to tension (r = -.30). Instability is the least significantly related environmental dimension. It is significanlty related only to tension (r = .30). Instability is not significantly related to flexibility (r = .08), although it is in the right direction, and therefore provides evidence to reject Derived Corollary 5. Vertical Feedback is significantly related to communication (r = .34), tension (r = -.37) and goal attainment (r = .44). Horizontal Feedback is significantly related to socialization and goal attainment at the .10 level (r = -.22 and .18 respectively). It is also significantly related to tension (r = .32) and commitment (r - .37). Neither vertical nor horizontal feedback are significantly related to flexibility as was predicted by Derived Corollary 11. Also note that while vertical feedback tends to have the predictable effect of reducing tension and increasing communication and goal attainment, horizontal feedback tends to increase tension and at the same time increase commitment. It would appear that the County Extension Councils tend to provide feedback that results in an increased workload and increased pressure to work with clientele groups and programs which are not to the liking of the staff.

Table 2 contains the first order partial correlation coefficients corrected for attenuation. Note that there does not seem to be any significant change in the relationships between the environmental variables and the organizational structure and process variables. This would indicate that perceived environmental uncertainty does not act as a causal intervening variable between the environment and the organization. An interesting note is that the magnitudes of the relationships between goal attainment and the structure/process variables socialization, flexibility, tension and commitment are all reduced when controlling on environmental uncertainty. This would indicate that the level of uncertainty has a strong indirect effect on goal attainment through these variables.

The next step in the data anlaysis involves using path analytic techniques. The goal of this section is to apply the principles of the axiomatic theory developed earlier to this data set. Since the axiomatic theory was not particularly supported in the bivariate correlation analysis, it would be useful to see how the variables in the model are systematically interacting.

The first model, Figure 1, is presented as a test of the intervening causal variable in the axiomatic theory. Note that the significance level of the chi square test (<.10) indicates that the model should be rejected. Note that the ratio of chi square to the degrees of freedom is 1.57. The Ksi (latent independent variables) and Eta (latent dependent variables) are defined as follows:

Ksi 1 = Competition	Eta 1 = Environmental Uncertainty
Ksi 2 = Vertical Feedback	Eta 2 = Socialization
Ksi 3 = Horizontal Feedback	Eta 3 = Communication
Ksi 4 = Environmental Capacity	Eta 4 = Flexibility

Eta 5 = Tension
Eta 6 = Commitment
Eta 7 = Goal Attainment

Environmental instability was dropped from the model due to its low correlations with the other variables in the model. This variable should be respecified in future analyses. The indicator weighting estimates (lambdas) and the indicator measurement error estimates (theta deltas - independent, theta epsilon - dependent) are presented with their standard errors in Appendix A. The standardized path coefficients are given in parentheses for the gamma (ind→dep), beta (dep→dep) and zeta (specification error) estimates. Note that the beta coefficients signs have already been reversed in direction. Additionally, the estimated true variances for the Eta and Ksi factors are given in the circles.

Given the findings from the correlation and partial correlation analysis the rejection of this model using this data set might have been expected. A more adequate test of the model would employ a sample from the population of organizations which are adequately coping with perceived environmental uncertainty.

The finding that this data does not support the theory leads to the question of what model is appropriate for organizations like county Extension offices, where the effect of perceived environmental uncertainty appears to have a very strong negative impact on organization structure and processes? Inductive path analytic techniques were employed to derive such a model. Practical limits of time and money prevented the author from going beyond a few revisions from a fully recursive model. Figure 2 represents the best model derivable given these constraints. Appendix B contains the indicator weighing estimates and the indicator measurement error estimates.

The chi square test of significance for this model indicates that the model still should be rejected. The predicted covariance structure still could have been achieved by chance although the ratio of chi square to the degrees of freedom (1.71) has been improved quite a bit over the first model. Additionally, an examination of the R^2 values for each equation indicates that this model explains a large percent of the true variance in perceived environmental uncertainty (R^2=.21), socialization (R^2=.38), tension (R^2=.29), commitment (R^2=.34) and goal attainment (R^2=.48). The model does not explain very well communication (R^2=.12) and flexibility (R^2=.11). The most revealing aspect of this model is the fact that perceived environmental uncertainty does not act as a significant intervening factor. The environmental dimensions tend to have large significant direct effects on the organizational structure and process variables. Competition appears to have the strongest effect on the structure and process variables. Note that competition is not significantly related to perceived environmental uncertainty when controlling on vertical and horizontal feedback, but it is the only variable significantly related to flexibility (-.25 std. path coeff.), and tension (.80). Competition is also significantly related to commitment (-.20) as is horizontal feedback (.21) and communication (.37). Finally, competition (-.25) vertical and horizontal feedback (.27 and .28 respectively) all make significant unique contributions to explaining goal attainment. The only organizational process variable that significantly impacts goal attainment when controlling on these environmental factors is socialization (.36). Notice that perceived environmental uncertainty does not significantly relate to any of the process structure variables except socialization (-.59), when controlling on the environmental factors. This

finding is very interesting given the significant correlations found between uncertainty and the structure/process variables.

The model presented in Figure 2 is limited in that it does not allow for the possibility that organizational structure and process variables might affect the environmental dimensions. Yuchtman and Seashore (1967) state that organizations are effective to the extent that they secure scarce resources from the environment. These resources might include useful information as well as physical resources. Additionally, organizations can reduce uncertainty by controlling changes in their environment through proactive political strategies (Price, 1968). The theory and model would have to be revised substantially to take into account this type of two-way interaction. Further, if the structure process variables affect the environmental variables, one factor that must be considered is the lag time for effects to become significant.

SUMMARY

The goal of this paper was to develop a theory of (O/E) interaction. An axiomatic theory was developed. This theory originally appeared to be very broad in scope in that it was applicable to all organizations which can be categorized as open systems. It was found through the empirical analysis that the theory may be appropriate only for organizations which are coping well with conditions of uncertainty. The concepts which were utilized were not time specific nor restricted to one culture. The axiomatic theory was restricted also to the extent that it did not cover all of the dimensions of O/E interaction and it did not allow for two-way causation.

The theory is rather parsimonious considering the causal nature of the general propositions. If the author had relied upon the more traditional interpretation of the sign rule more propositions could have been derived. The author feels that if one is engaged in the process of theory construction in a relatively new area it does more good to draw all available information together, and then derive the tightest theory possible, thereby making a statement of the current knowledge we have in this area, which will serve as a building block for future researchers, rather than deriving all possible combinations of concepts.

Another aspect of the parsimony of the theory has to do with its evaluation. The theory is built on the intervening concept of environmental uncertainty. A test of the theory is available by utilizing the methods specified by Costner and Liek (1964).

Although data was not available to directly test the theory, the principle of the theoretical linkages were examined using an existing data set. The theory was not supported with this data set, but it was found that the theory may only be appropriate for organizations which are coping well with conditions of uncertainty, and the county Extension offices do not appear to be in this category. Another factor which should be considered before rejecting the theory is that objective measures of such variables as centralization, differentiation and formalization were not available in the data set. It would not be appropriate to reject the theory on the basis of analysis using expedient variables. Further analysis using a different population of organizations would be enlightening.

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TABLE 1: Zero Order Correlation Coefficients Corrected for Attenuation

		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
X_1	Env. Competition	1.00	-.26**	.26**	-.33***	.06	.50***	.11	-.32***	-.36***	.51***	-.30**	-.45***
X_2	Env. Capacity		1.00	.35***	.09	.16	-.28**	.33**	.02	.00	.30**	.10	.24**
X_3	Env. Instability			1.00	-.03	.15*	.02	.09	.00	.08	.30***	-.12	.00
X_4	Vertical Feedback				1.00	-.14	-.11	.07	.34***	.04	-.37***	-.01	.44***
X_5	Horizontal Feedback					1.00	-.04	-.22*	.14	.14	.32***	.37***	.18*
X_6	Env. Uncertainty						1.00	-.74***	-.28**	-.31***	.34**	-.13	-.39***
X_7	Org. Socialization							1.00	-.00	.26**	.23*	.10	.33**
X_8	Org. Communication								1.00	.30***	.04	.48***	.23***
X_9	Org. Flexibility									1.00	-.13	.34***	.12
X_{10}	Org. Tension										1.00	-.02	-.23**
X_{11}	Org. Commitment											1.00	.19*
X_{12}	Org. Goal Attainment												1.00

*significant at .10
**significant at .05
***significant at .01

TABLE 2: First Order Partial Correlation Coefficients Controlling on Perceived Environmental Uncertainty and Corrected for Attenuation

		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_9	X_{10}	X_{11}	X_{12}
X_1	Env. Competition	1.00	-.14	.31	-.32	.09	.82	-.55	-.25	.42	-.27	-.32
X_2	Env. Capacity		1.00	.36	.06	-.18	.19	.11	-.10	-.23	.07	.15
X_3	Env. Instability			1.00	-.03	.15	.11	.01	.08	.32	-.12	-.02
X_4	Vertical Feedback				1.00	-.14	-.02	.39	.01	-.36	-.02	.43
X_5	Horizontal Feedback					1.00	-.37	.16	.13	.36	.37	.18
X_6	Env. Uncertainty						XXXX	XXX	XXX	XXX	XXX	XXX
X_7	Org. Socialization						1.00	.32	.05	.03	.02	.07
X_8	Org. Communication							1.00	.42	-.06	.54	.38
X_9	Org. Flexibility								1.00	-.03	.32	-.00
X_{10}	Org. Tension									1.00	-.03	.11
X_{11}	Org. Commitment										1.00	.15
X_{12}	Org. Goal Attainment											1.00

Currently there is no significance test for corrected partial correlation coefficients.

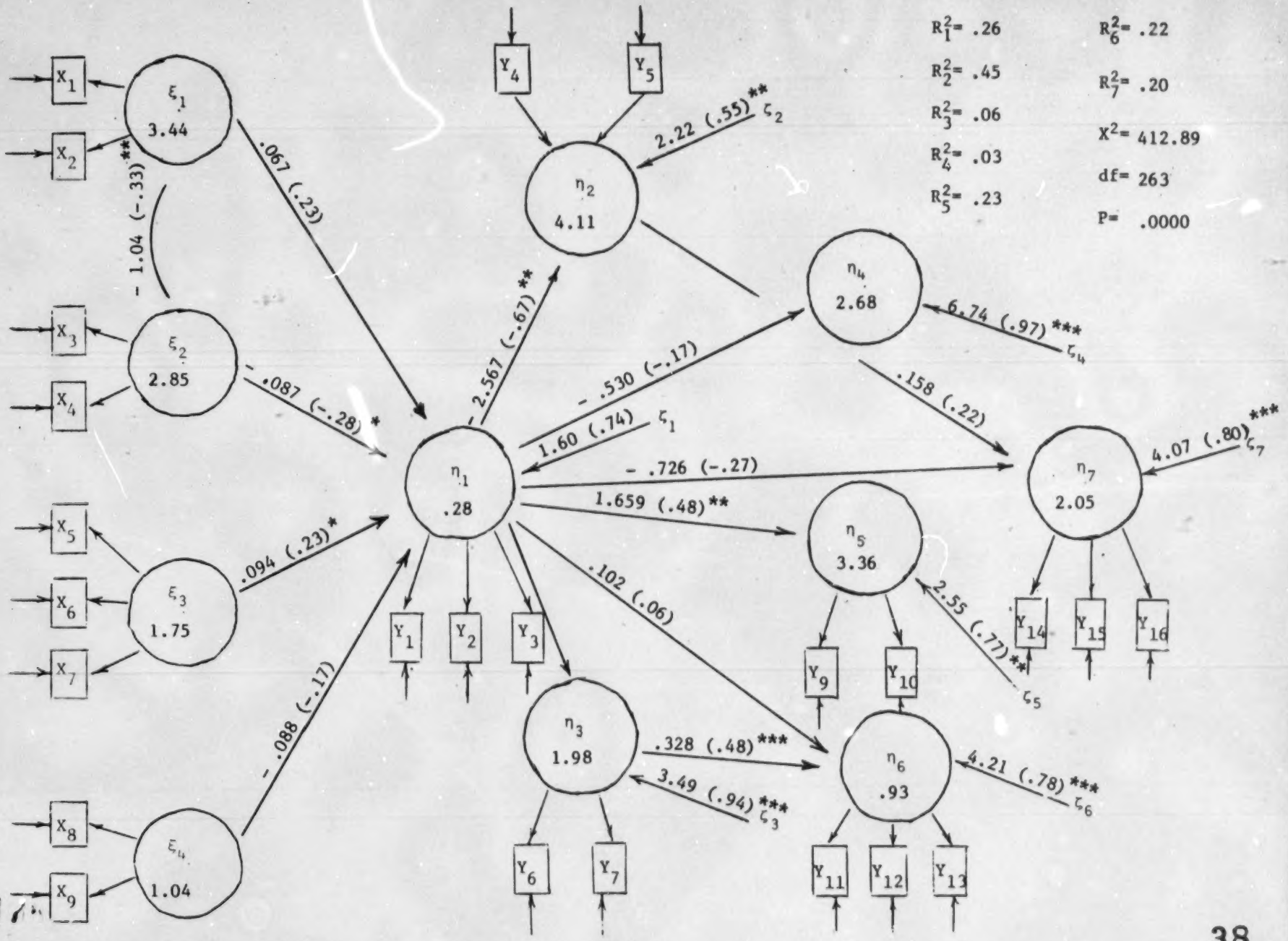

FIGURE 1 Explicit test of the intervening causal variable
*** significant at .01; ** significant at .05; * significant at .10

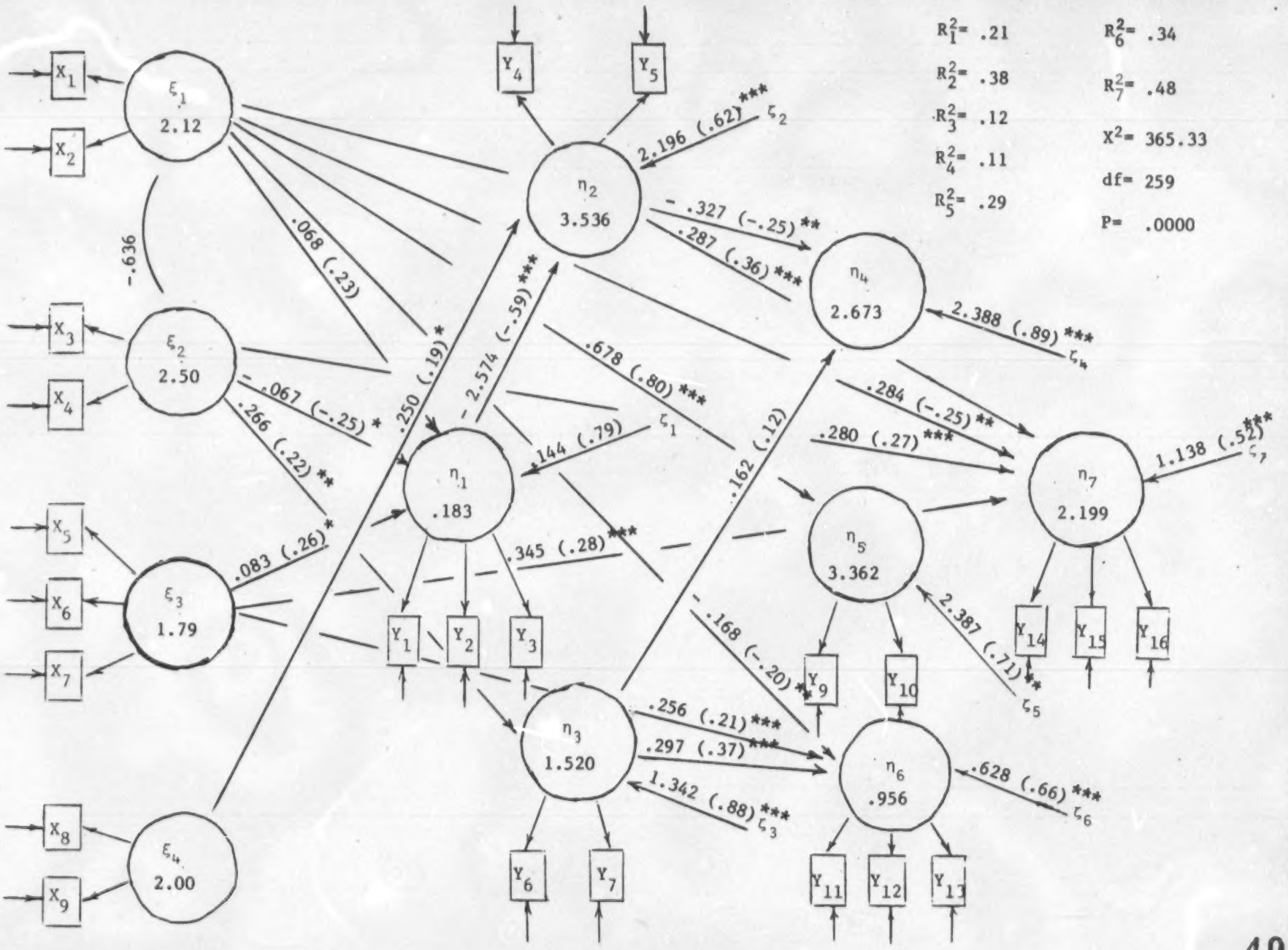

FIGURE 2 REVISED MODEL
***significant at .01; **significant at .05; *significant at .10

APPENDIX A

Parameter estimates and standard errors for lambdas, theta deltas and theta epsilons

Parameter	Maximum Likelihood Estimates	Standard Error	Parameter	Maximum Likelihood Estimates	Standard Error
λX1	1.00*		θδ1	1.48	1.28
λX2	.72	.28	θδ2	2.77	.77
λX3	1.00*		θδ3	.99	.70
λX4	1.36	.35	θδ4	3.12	1.35
λX5	1.00*		θδ5	2.00	.36
λX6	1.43	.23	θδ6	.23	.43
λX7	1.18	.19	θδ7	2.81	.51
λX8	1.00*		θδ8	4.13	1.34
λX9	2.28	2.66	θδ9	-1.60	6.21
λY1	1.00*		θε1	1.94	.30
λY2	2.91	.93	θε2	.61	.33
λY3	1.06	.45	θε3	2.23	.34
λY4	.55	.16	θε4	3.70	.61
λY5	1.00*		θε5	.17	.92
λY6	1.00*		θε6	1.10	.41
λY7	.88	.18	θε7	.53	.30
λY9	1.00*		θε9	2.62	1.03
λY10	.99	.30	θε10	2.88	1.05
λY11	1.00*		θε11	.46	.10
λY12	1.44	.17	θε12	.61	.19
λY13	.74	.10	θε13	.37	.07
λY14	1.00*		θε14	1.32	.26
λY15	.90	.11	θε15	.70	.17
λY16	1.04	.13	θε16	.88	.22

* indicates a fixed value

APPENDIX B

Revised Model

Parameter estimates and standard errors for lambdas, theta deltas and theta epsilons

Parameter	Maximum Likelihood Estimates	Standard Error	Parameter	Maximum Likelihood Estimates	Standard Error
$\lambda X1$	1.00*		$\theta\delta1$	2.80	.59
$\lambda X2$	1.16	.26	$\theta\delta2$	1.72	.59
$\lambda X3$	1.00*		$\theta\delta3$	1.35	.45
$\lambda X4$	1.55	.28	$\theta\delta4$	2.39	1.03
$\lambda X5$	1.00*		$\theta\delta5$	1.96	.34
$\lambda X6$	1.40	.20	$\theta\delta6$	.30	.33
$\lambda X7$	1.18	.19	$\theta\delta7$	2.78	.48
$\lambda X8$	1.00*		$\theta\delta8$	3.17	1.41
$\lambda X9$	1.19	.80	$\theta\delta9$	1.00	1.88
$\lambda Y1$	1.00*		$\theta\varepsilon1$	2.04	.30
$\lambda Y2$	4.32	1.71	$\theta\varepsilon2$	-.45	.73
$\lambda Y3$	.94	.46	$\theta\varepsilon3$	2.39	.35
$\lambda Y4$	.61	.15	$\theta\varepsilon4$	3.56	.58
$\lambda Y5$	1.00*		$\theta\varepsilon5$	.63	.62
$\lambda Y6$	1.00*		$\theta\varepsilon6$	1.56	.38
$\lambda Y7$	1.14	.25	$\theta\varepsilon7$	.07	.39
$\lambda Y9$	1.00*		$\theta\varepsilon9$	2.64	.98
$\lambda Y10$	1.00	.28	$\theta\varepsilon10$	2.87	1.00
$\lambda Y11$	1.00*		$\theta\varepsilon11$	.43	.10
$\lambda Y12$	1.38	.16	$\theta\varepsilon12$	.71	.18
$\lambda Y13$	.74	.09	$\theta\varepsilon13$	.37	.07
$\lambda Y14$	1.00*		$\theta\varepsilon14$	1.25	.25
$\lambda Y15$	.88	.10	$\theta\varepsilon15$	.73	.16
$\lambda Y16$	1.02	.12	$\theta\varepsilon16$	.90	.21

* indicates a fixed value